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10/647,715	08/25/2003	Horng-Huei Tseng	TS01-1629	2158

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EXAMINER	
TRAN, THANH Y	

ART UNIT	PAPER NUMBER
2827	

DATE MAILED: 05/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/647,715	TSENG, HORNG-HUEI	
	Examiner	Art Unit	
	Thanh Y. Tran	2827	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-29 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-29 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 11/24/03.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3-4, 12, 14, 17, 22 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Joo (U.S. 6,090,658).

As to claim 1, Joo discloses in figures 3 and 5, an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3) comprising the steps of:

providing the semiconductor substrate (comprising elements 1, 3) having partially completed circuits;

depositing an insulating layer (3) and forming openings (4) for node contacts (5); forming the node contacts (5) in the openings (4);

depositing sequentially a first metal layer (14) (see col. 4, lines 11-35, layer 14 is made of metal), a dummy layer (13) and a second metal layer (7) (see col. 3, lines 66-67, layer 7 if made of platinum (metallic material)) on the insulating layer (3) and over the node contacts (5);

patterning the second metal layer (7), the dummy layer (13), and the first metal (14) layer and leaving portions over the node contacts (5);

depositing a blanket third metal layer (8) on the substrate and over the portions, and etching back to form sidewall spacers on the portions to provide lower electrodes for the capacitors (see col. 2, lines 36-40);

depositing a blanket conformal interelectrode dielectric layer (IDL) (9) on the substrate and over the lower electrodes (see col. 2, lines 36-40);

depositing a blanket fourth metal layer (10) on the IDL layer (9) and patterning the fourth metal (10) form upper electrodes to complete the MTM capacitors (see col. 2, lines 36-40).

As to claims 3, 14 and 24, Joo discloses in figures 3 and 5, an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3), wherein

the node contacts (5) are formed by depositing a polysilicon layer sufficiently thick to fill the openings (4) and polishing back to the insulating layer (3) (see col. 4, lines 11-15).

As to claim 4, Joo discloses in figures 3 and 5, an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3), wherein

the first metal layer (14) is selected from the group that includes tantalum nitride ("TaN") (see col. 4, lines 30-35).

Claim 12 recites limitations similar to claim 1, Joo further teach an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3) comprising the steps of:

depositing a first metal layer (14) on the insulating layer (3) and over the node contacts (5); depositing a dummy layer (13) on the first metal layer (14), the dummy layer (13) composed

of an insulating material ("silicon oxide") (see col. 4, lines 23-25); depositing a second metal layer (7) on the dummy layer (13); patterning the second metal layer (7), the dummy layer (13), and the first metal layer (14) and leaving portions over the node contacts (5).

Claim 22 recites limitations similar to claim 1, Joo further teaches an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3), wherein

a dummy layer (13) comprised of an insulating material ("silicon oxide") (see col. 4, lines 23-25).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 2, 13 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joo (U.S. 6,090,658) in view of Lu et al (U.S. 6,677,251).

As to claims 2,13 and 23, Joo does not teach the insulating layer is silicon oxide deposited by chemical vapor deposition to a thickness of between about 3000 and 12000 Angstroms. Lu et al teaches in figure 2A, a substrate (20) having an insulating layer (28) is silicon oxide (SiO_2) deposited by chemical vapor deposition to a thickness of between about 3000 and 12000 Angstroms (see col. 7, lines 22-45 and col. 2, lines 13-17). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by using silicon oxide material for the insulating layer deposited

by chemical vapor and has a thickness of between about 3000 and 12000 Angstroms as taught by Lu et al. One of ordinary skill in the art would have been motivated because using the chemical vapor deposition for the insulating layer having a thickness of between about 3000 and 12000 Angstroms in order to increase capacitance distributions (see col. 7, lines 22-45 in Lu's reference).

Furthermore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo and Lu et al by using chemical vapor process for depositing the insulation layer having a thickness of between about 3000 and 12000 Angstroms for the purpose of increasing capacitance distributions, since it has been held that where the general condictions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

5. Claims 5 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joo (U.S. 6,090,658) in view of Schuele et al (U.S. 5,930,639).

As to claims 5 and 15, Joo does not teach the first metal layer is a transition metal selected from the group that includes platinum and is deposited to a thickness of between about 100 and 1000 Angstroms. Schuele et al teaches in figure 2, an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate comprising the steps of: depositing a first metal layer (22) which is a transition metal selected from the group that includes platinum (see col. 1, lines 48-64). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by using platinum material as taught by Schuele for depositing the first

metal layer on the substrate. One or ordinary skill in the art would have been motivated because using platinum material would provide highly conductive and non-reactive material for the formation of capacitor electrodes (see col. 1, lines 34-47 in Schuele's reference). Joo and Schuele do not teach the thickness of between about 100 and 100 Angstroms for the first metal layer. It would also have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo and Schuele by depositing the first layer with a thickness of between about 100 and 1000 Angstroms for the purpose of preventing the diffusion into the insulating layer of the substrate, since it has been held that where the general condictions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

6. Claims 6-7, 8, 10, 16-18, 20, 25-26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joo (U.S. 6,090,658).

As to claim 6, Joo does not teach the dummy layer is deposited to a thickness of between about 2000 and 12000 Angstroms. It would also have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by depositing the dummy layer with a thickness of between about 2000 and 12000 Angstroms for the purpose of increasing capacitance distributions, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

As to claim 16, Joo discloses in figures 3 and 5, an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3), wherein

the dummy layer (13) is an insulating material (see col. 3, lines 31-32).

Joo does not teach the dummy layer is deposited to a thickness of between about 2000 and 12000 Angstroms. It would also have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by depositing the dummy layer with a thickness of between about 2000 and 12000 Angstroms for the purpose of increasing capacitance distributions, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

As to claims 7 and 17, Joo discloses in figures 3 and 5, an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3), wherein

the dummy layer (13) is an insulating material and selected from the group that includes silicon oxide (see col. 3, lines 31-32).

As to claims 8 and 18, Joo discloses in figures 3 and 5, an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3), wherein

the second metal layer (7) is selected from the group that includes platinum (see col. 2, lines 15-17 and col. 4, lines 2-4).

Joo does not teach depositing the second metal layer with a thickness of between about 100 and 600 Angstroms. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by depositing the second metal layer with a thickness of between about 100 and 600 Angstroms for the purpose of preventing the diffusion into the insulating layer of the substrate, since it has been held that where the general condictions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

As to claims 10, 20, and 28, Joo discloses in figures 3 and 5, an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3), wherein

the blanket conformal interelectrode dielectric layer is selected from the group that includes barium strontium titanate ("BST") (see col. 2, lines 36-40).

Joo does not teach the blanket conformal interelectrode dielectric layer is formed to a thickness of between about 10 and 500 Angstroms. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by depositing the blanket conformal interelectrode dielectric layer with a thickness of between about 10 and 500 Angstroms for the purpose of preventing the diffusion into the insulating layer of the substrate, since it has been held that where the general condictions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

As to claim 25, Joo discloses in figures 3 and 5, an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3), wherein

the lower first metal layer (14) is selected from the group that includes tantalum nitride ("TaN") (see col. 4, lines 30-35); and the upper second metal layer (7) is selected from the group that includes platinum (see col. 2, lines 15-17 and col. 4, lines 2-4).

Joo does not teach depositing the upper second metal layer with a thickness of between about 100 and 1000 Angstroms. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by depositing the second metal layer with a thickness of between about 100 and 1000 Angstroms for the purpose of preventing the diffusion into the insulating layer of the substrate, since it has been held that where the general condictions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

As to claim 26, Joo further teaches an apparatus and a corresponding method for making stacked metal-insulator-metal (MIM) capacitors on a semiconductor substrate (1, 3), wherein

a dummy layer (13) comprised of an insulating material ("silicon oxide") (see col. 4, lines 23-25).

Joo does not teach the dummy layer having a thickness of between about 200 and 12000 Angstroms. It would also have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by depositing the dummy layer with a thickness of between about 2000 and 12000 Angstroms for the purpose of increasing capacitance distributions, since it has been held that where the general conditions of a claim are

disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

7. Claims 9, 11, 19, 21, 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joo (U.S. 6,090,658) in view of Sandhu et al (U.S. 5,335,138).

As to claims 9, 19 and 27, Joo does not teach the blanket third metal layer is selected from the group that includes platinum. Sandhu et al teaches in figure 2, the metal layer (44) is formed of platinum. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by using platinum material for depositing the metal layer of the capacitor as taught by Sandhu et al. One of ordinary skill in the art would have been motivated to use a platinum material for depositing a layer of the MIM capacitors because platinum material has a high melting point (see col. 5, lines 63-67 in Sandhu's reference). Joo and Sandhu do not teach the blanket third metal layer is deposited to a thickness of between about 100 and 1000 Angstroms. It would also have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo and Sandhu by depositing the blanket third metal layer with a thickness of between about 100 and 1000 Angstroms for the purpose of preventing the diffusion into the insulating layer of the substrate, since it has been held that where the general condictions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

As to claims 11, 21 and 29, Joo does not teach the blanket fourth metal layer is selected from the group that includes platinum. Sandhu et al teaches in figure 2, an apparatus comprising

the blanket metal layer (52) is selected from the group that includes platinum (see col. 6, lines 64-67). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo by using platinum material for depositing the metal layer such as a blanket metal layer of the capacitor as taught by Sandhu et al. One of ordinary skill in the art would have been motivated to use a platinum material for depositing a metal layer of the MIM capacitors because platinum material has a high melting point (see col. 5, lines 63-67 in Sandhu's reference).

Joo and Sandhu do not teach the blanket metal layer is formed of a thickness of between about 100 and 1200 Angstroms. It would also have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the apparatus of Joo and Sandhu by depositing the blanket fourth metal layer with a thickness of between about 100 and 1200 Angstroms for the purpose of preventing the diffusion into the insulating layer of the substrate, since it has been held that where the general condictions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Hartner et al (U.S. 6,559,003) teaches Method of producing a ferroelectric semiconductor memory.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Y. Tran whose telephone number is (571) 272-2110. The examiner can normally be reached on Monday through Thursday and on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo, can be reached on (571) 272-1957. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3431.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

TYT